

Forward to the Past
- The Days of Joy of Creation -

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Abstract

This paper points out that we should put more marketability into the processes themselves, although the conventional engineering approaches put major emphasis upon the quality and performance of a final product with much less value attached to the activity of design and production themselves. But with the increasing abundance of products everywhere, the customers tend to put more attention to the processes and find more joy and satisfaction from them, as we can see in the cases of TV games and artistic works. To realize such a production system, the society itself has to be changed from a pyramid type to a network one. In the network society, the communication of concepts is very much important and we have to develop non-verbal communication techniques. VR is expected to provide a very versatile and powerful tool for this purpose, but it should be emphasized that the true reproduction of a real world is not a key word here. Rather, we should pay more attention to such simplified tools as sketches which not only provides the tool for non-verbal communication , but also represents the knowledge and experience of the drawer. Some curve and surface generating methods are developed for this purpose and are presented here.

Keywords: Product Development, Market In, Customer's Satisfaction,
Process-oriented Approach, Non-verbal communication,
Sketches, Curve and Surface Generation, Trend

1. Introduction

This paper points out that we should put more marketability into the processes themselves, although the conventional engineering approaches put major emphasis upon the quality and performance of a final product. But with the increasing abundance of products everywhere, the customers tend to put more attention to the processes and find more joy and satisfaction from them. Further, the society itself is changing from a pyramid type to a network one. In the network society, the communication of concepts is very much important and we have to develop non-verbal communication techniques. VR is expected to provide a very versatile and powerful tool for this purpose, but it should be emphasized that the true reproduction of a real world is not a key word here. Rather, we should pay more attention to such simplified tools as sketches. It is because they not only provides the tool for non-verbal communication , but also represents the knowledge and experience of the drawer. Some curve and surface generating methods are developed for this purpose and are presented here.

2. Processes are Getting More Values These Days.

Up to now, the production has been considered just as a means to an end. Thus, it is evaluated only from the standpoint of final products. This product development system is efficiency-oriented and based on the tree framework.

How is the situation today? Abundant products are produced day in and day out so that people are quickly losing interest in the final products themselves. Then, what will be the competitiveness? We would like to insist that it will be the process itself of product development.

TV games are very popular today especially among young people. The author thinks that they are none other than the product that sells the process. If they are to be evaluated by the final outputs as the conventional products are, poor players certainly would not buy TV game machines. But the fact is that even the poor players buy them and visit the game centers repeatedly. This is considered because these kinds of products sell the process itself.

This may be interpreted that young people are being attracted more and more by the processes themselves than the products because of their excessive abundance.

We are told that young people are getting away from the production fields because they lost interest. But on the other hand many of them are learning welding, for example, very eagerly for the sculptural artwork. And let us consider another example. Young people buy standard cars but they invest much more money for customizing them.

How should we interpret these phenomena? We would like to point out that they mean the coming of the age when we can sell processes.

Kansei is attracting much attention these days. But its discussion is still oriented toward final products. We feel that we should move more toward developing values in the processes themselves. If we are to talk about art, this should be more emphasized.

3. Selling Products or Processes. What is the Difference?

The conventional product development has been carried out in the framework of a tree. But if we are now changing rapidly from the pyramid society into the network society. This is the large difference in the background. The network society is composed of heterogeneous people while the pyramid one is homogeneous. In the network society interactions play the important role and it is expected that these interactions will produce new ideas. We would like to point out that these interactions themselves will provide a very large amount of satisfaction. If we could create such a system, then people would find more and more values in the interactive activities themselves and thus we can attach marketability to the processes themselves.

The majority of the people involved in the conventional product development are experts and experts can communicate among themselves using their own symbolic expressions. Thus, the past system was "product out". If we are to move toward "market in" system and get more and more people involved and let them participate "actually or virtually" in the product development for selling them the processes, we have to pay more

emphasis on the non-verbal or non-symbolic expressions because the customers are non-experts and they do not have such technical verbal expression as experts have. Thus, we expect that VR will provide a versatile and very strong tool for this purpose.

4. VR as We Hope to Be

The progress of VR technology is too much remarkable, but we should like to point out that from our standpoint of letting people have the joy of creating products, the most important aspect is that through using the VR technology, people are convinced that their concepts or ideas are really taken into the system or the network of the product development. From this standpoint, we do not have to reproduce the real world as it is. Rather, the aspect of interactions are more important. If people can feel that they can convey their models to others, they will be very much satisfied. Thus, model conveyance among people involved is the most important point for sharing activities for product development.

5. Sketches : How They Are Important.

People use sketches very often to convey their concepts and ideas. What is very important is that how they are simplified reflects the knowledge and/or experience of the ones who draw them [1].[2]. Thus, a sketch means more than just one of these non-verbal expressions.

Sketches can be characterized in two ways. One is to characterize them in their final forms. The other is to pay attention to how they are being drawn. The majority of the present work is done with respect to the former. But if we take into account the communication processes, the latter seems to be non the less important.

6. Curve and Surface Generation: A Human Friendly Approach

Thus, we developed more human friendly ways of curve and surface generation. It might seem to be a little bit different from VR, but we are convinced that these techniques can be well incorporated into the VR framework in the very near future, if we put more weight on its interaction

aspect. These are just an initial step toward that goal.

6.1 New Curve Generation Technique

This newly developed techniques aims at permitting people to draw a curve as they wish just as if they are drawing on a piece of paper. What characterizes this technique is that we developed it by noting the "trend" of a curve generation.

The conventional CAD models are more oriented toward reproducing real images of products as truly as possible. Thus, although they are very highly accurate, the amount of work needed to draw them is too much.

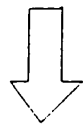
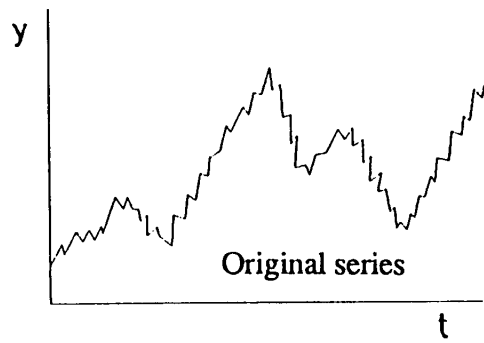
More emphasis is placed in our method upon the reproduction of the process itself of drawing it rather than that of the final form. A curve is generated in our method in the following procedures:

- (1) Direct curve drawing upon the CRT,
- (2) Smoothing of the data points using moving average technique (Fig.1),
- (3) Fitting of a regression line (Fig.2),
- (4) Extraction of characterizing points (Fig.3),
- (5) Final curve generation (Fig.4).

What characterizes our method is that we can modify the curve at any time and at any point as we wish. The curves are very difficult to modify once they are drawn in the majority of the past CAD systems. We can easily modify the curve by drawing another desired curve near it (Fig.5). Further, our method permits us to modify locally(Fig.6) or globally(Fig.7). Such a capability is added because we noticed that people pay their attention globally at the initial stages but as the work progresses, they tend to focus them to more local aspects. Thus, the control of the view from global to local or vice versa is very much important.

6.2 New Surface Generation Technique

The above direct curve generation technique is extended to the surface. In this method, a point is picked up and pulled in the virtual space and the



Moving average

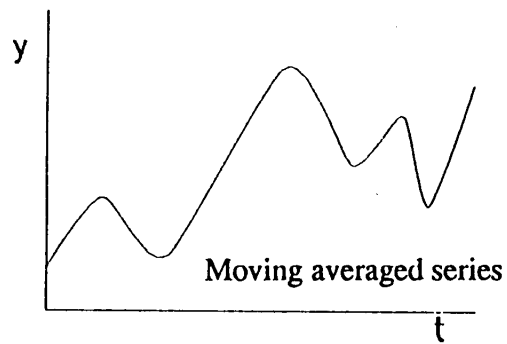


Fig.1 Smoothing by Moving Average Technique

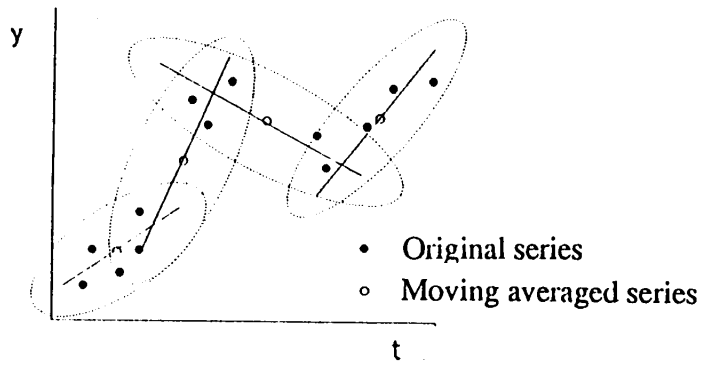


Fig.2 Fitting of a Regression Line

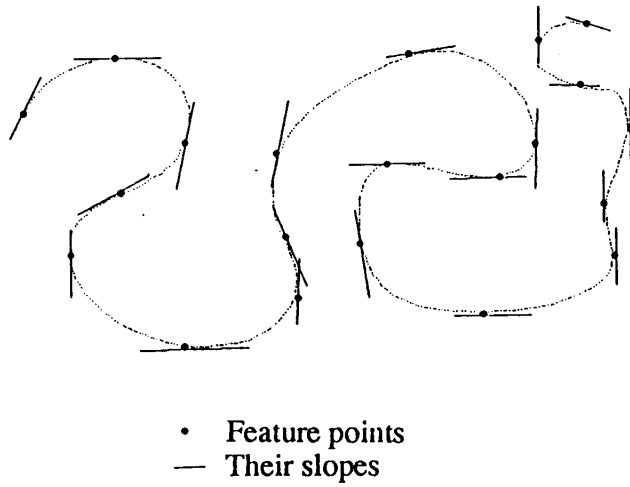


Fig. 3 Extraction of Characterizing Points

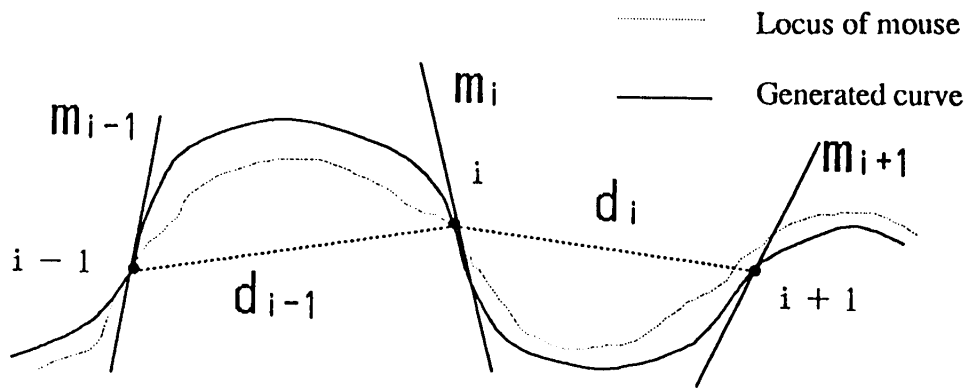


Fig. 4 Final Curve Generation

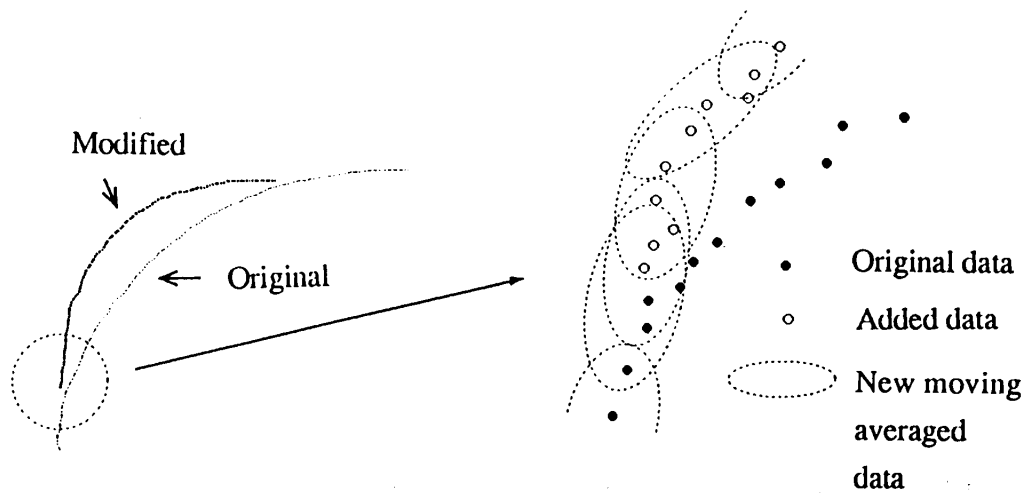
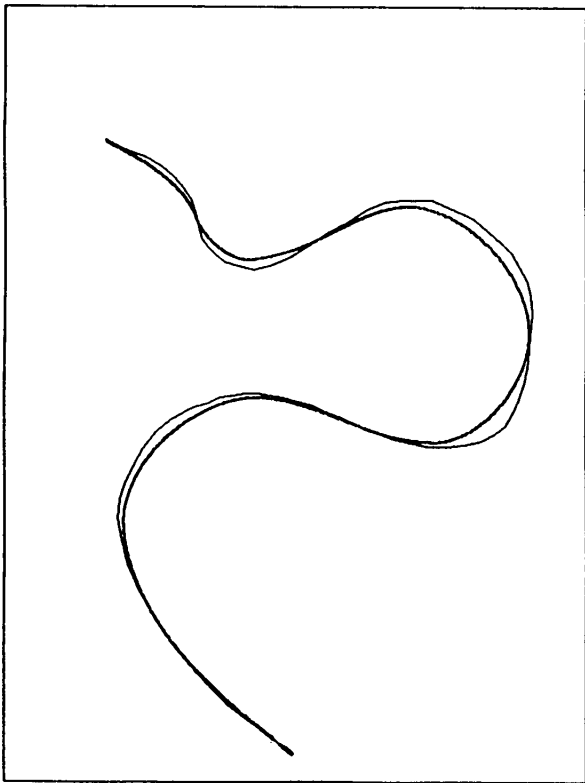
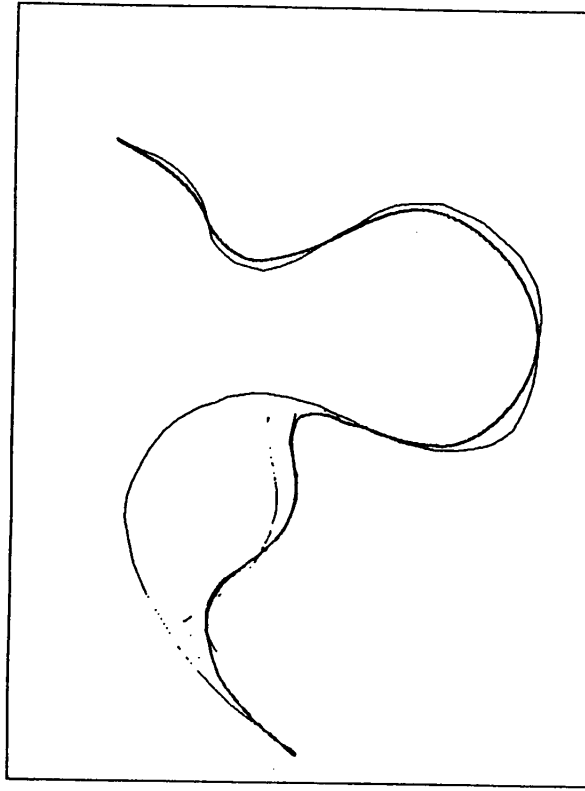


Fig. 5 Curve Modification

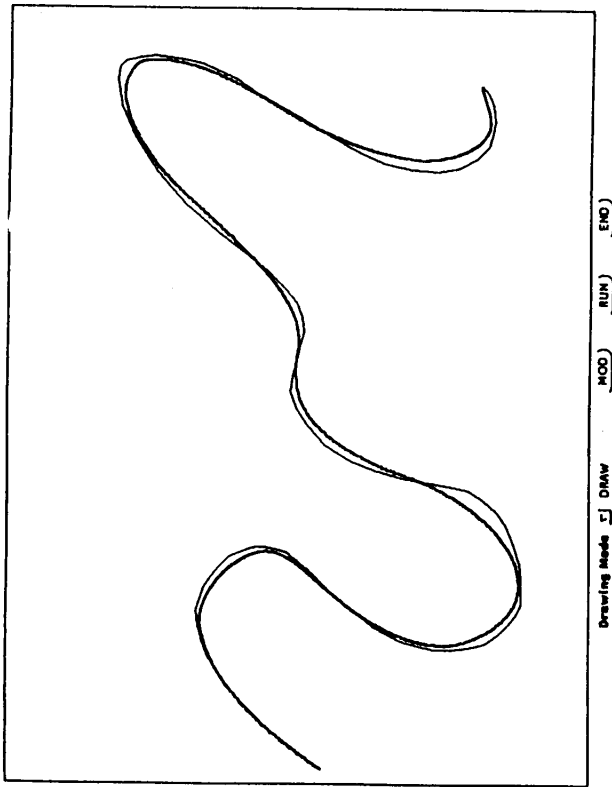


(a) Original

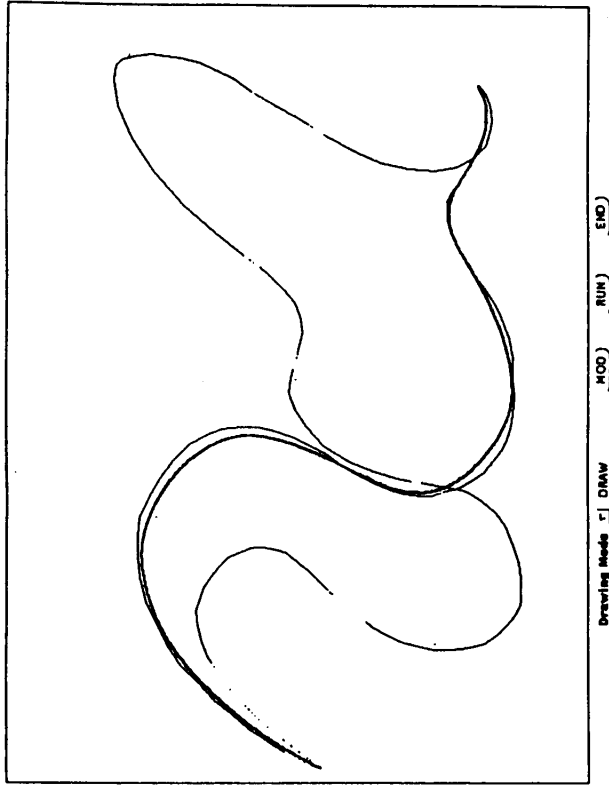


(b) After modification

Fig. 6 Local Modification



(a) Original



(b) After modification

Fig. 7 Global Modification

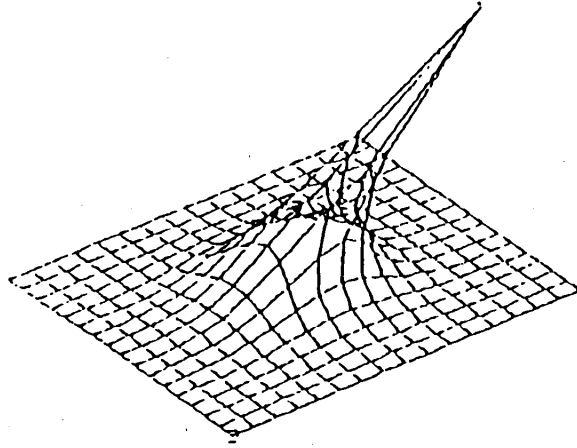


Fig. 8 Pick Up Operation

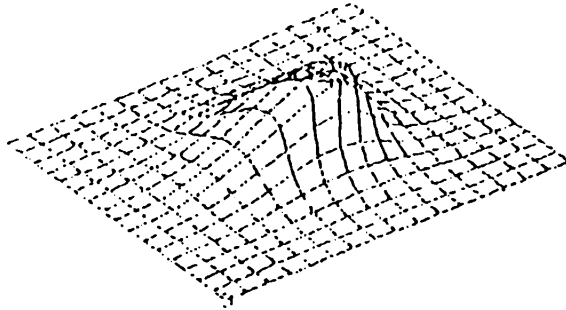


Fig. 9 Release Operation

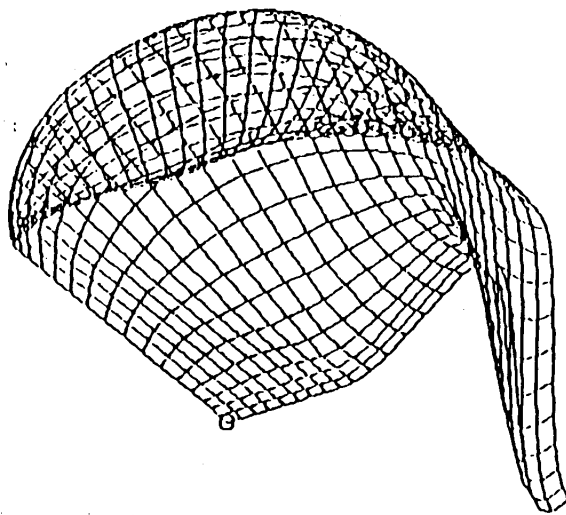


Fig.10 Sample

surrounding planes are pulled together to be fitted into a smooth surface.

We developed the following two methods.

The first one proceeds as follows:

First, a plane is divided into $m \times n$ data points. Next, we specify a point and move it to the location we desire. The following procedures are similar to the ones mentioned in the previous section of a curve generation (Fig.8 and Fig.9).

The second one goes as follows:

In this method, we introduced two new parameters u and v . The surface is modified by the following equation using u, v , amount of shift of a point Δ and influencing width d_0 (Fig.10).

$$\Delta S(u, v) = \Delta \sum_{i=0}^3 B_i^3 \left(\frac{d}{d_0} \right) P_i \quad \left(\frac{d}{d_0} \leq 1 \right)$$

7. Possibility of Linkage with Stereolithography

The generation methods described above permit us to generate a curve or a surface on a computer connected to the stereolithography and can send the data to the VR machine to present its image in the 3 dimension. If we can be sure of the image we conceive, we can send it back to the stereolithography machine for rapid prototyping or vice versa.

What is the advantage of this approach is that we are relieved from the burden of preparing the image data suited to the stereolithography from CAD data. We can easily modify the image as we wish either from VR machine or from stereolithography machine.

8. Concluding Remarks

We believe that we are now heading toward the more process-oriented age. But if we look back into the past, we enjoyed creating things even when we really needed them. At that time, processes and products are unseparable and design and production was fused into one and provided the joy of creation. Thus, we may say that we are stepping forward to the past.

In this paper, we discussed the importance of a sketch as the conveyor of an image and described our attempts for generating a curve or a surface as we wish.

References

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- [2] Japan Society of Mechanical Engineers ed., Form and Design, 1993, Baifukan (in Japanese).